



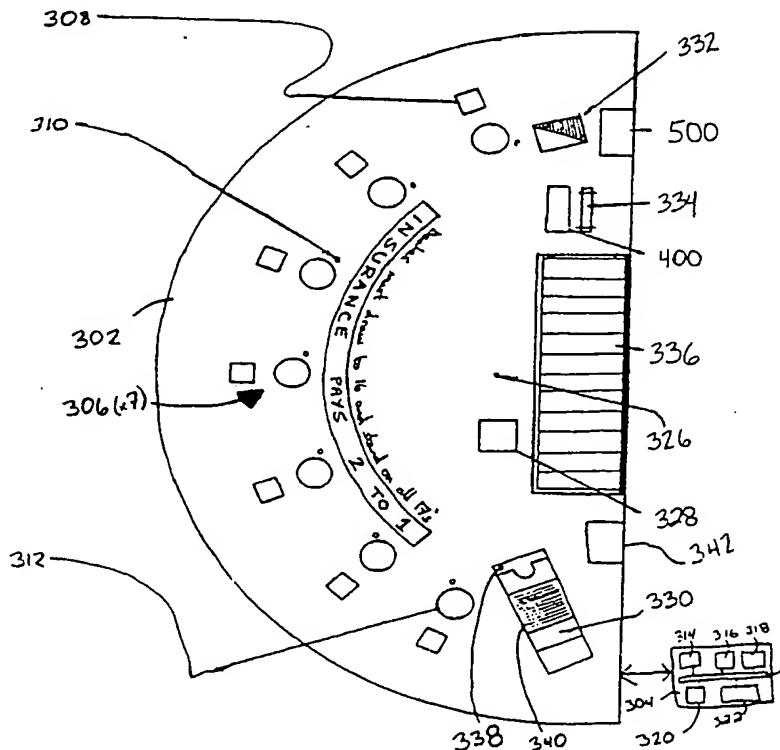
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁷ : G08B	A2	(11) International Publication Number: WO 00/22585
		(43) International Publication Date: 20 April 2000 (20.04.00)
<p>(21) International Application Number: PCT/US99/23778</p> <p>(22) International Filing Date: 13 October 1999 (13.10.99)</p> <p>(30) Priority Data: 60/104,041 13 October 1998 (13.10.98) US Not furnished 12 October 1999 (12.10.99) US</p> <p>(71)(72) Applicants and Inventors: GANZ, Jake [US/US]; 45 Gifford Street, Norwich, CT 06360 (US). BRADSHAW, William, R. [US/US]; 414 West Comer Road, North Stonington, CT 06359 (US). SMITH, Kingsley, L. [US/US]; 125 Frigate Drive, Madison, WI 53705 (US). SCHUTZBANK, Howard [US/US]; 6296 Onwentsia Trail, Oregon, WI 53575 (US). MANN, John [US/US]; 60 Richard Brown Drive, Uncasville, CT 06382 (US).</p> <p>(74) Agents: MOSER, Raymond, R., Jr. et al.; Thomason, Moser & Patterson, 2 Bridge Avenue, P.O. Box 8160, Red Bank, NJ 07701 (US).</p>		(81) Designated States: AE, AL, AU, BA, BB, BG, BR, CA, CN, CU, CZ, EE, GD, GE, HR, HU, ID, IL, IN, IS, JP, KP, KR, LC, LK, LR, LS, LT, LV, MG, MK, MN, MX, NO, NZ, PL, RO, SG, SI, SK, SL, TR, TT, UA, UG, UZ, VN, YU, ZA, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).
<p>Published <i>Without international search report and to be republished upon receipt of that report.</i></p>		

(54) Title: AUTOMATICALLY IDENTIFIABLE AND TRACKABLE ARTICLE AND SYSTEM INTERACTING WITH SAME

(57) Abstract

System and method of using said system in a casino-based environment to obtain information and identify player behavior and gaming token movement. The system comprises one or more gaming tables, a plurality of article identification sensors disposed within the gaming tables, a central processor connected to the sensors and a plurality of trackable articles disposed about the gaming tables. The trackable articles are such that they are capable of being detected by sensors and the central processor generates an historical profile and reward information of a player based upon movement of said trackable articles. The method for collecting information regarding and granting awards to a casino player via an automatic identification system includes recognizing the player via the automatic identification means, identifying a wagered amount by the player, locking the wagered amount into the system, allowing for play of the wagered amount, updating the system with the wagered amount, optionally awarding the player and updating the automatic identification means with the wagered amount and award.



FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakhstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

**AUTOMATICALLY IDENTIFIABLE AND TRACKABLE ARTICLE AND
SYSTEM INTERACTING WITH SAME**

This application claims the benefit of United States
5 Provisional Application No. 60/104,041, filed October 13,
1998 and is hereby incorporated herein by reference.

BACKGROUND OF THE DISCLOSURE

10 1. Field of the Invention

This invention relates to automatic identification and tracking of items using radio frequency signals. More particularly, this invention relates to gaming tokens and a system for interacting with said tokens for authentication 15 and monitoring purposes.

2. Description of the Background Art

Automatic identification systems are widely used to
20 input data into computer systems and to identify and monitor articles or personnel. For example, line-of-sight type systems use a scanning device such as a laser to read braced symbols which carry information about an article to which the braced symbol is attached (e.g. price, stock number or
25 the like). Another type of system uses magnetic encoding of information. The encoded information is contained on magnetic medium which is attached to the article (e.g. a credit card, automatic teller machine (ATM) card or the like). The information is read and the article identified
30 by passing the medium through a special reading device. Although these systems have wide-spread applications, they are limited in that the article to be identified must be in close proximity or momentarily contact the scanner or reader prior to use. Additionally, since the encoded information
35 must be physically accessible to the system (i.e. by line of sight or contact), a likelihood of tampering or misuse of the encoded information exists.

Radio frequency based identification systems are often used in applications where identification of an object is to

-2-

be made without contact and where the application may not permit line-of-sight communication between the object and a sensor. Radio frequency automatic identification ("RF/ID") systems are based on "targets" which generally function as transponders. Upon receipt of a radio frequency interrogating signal, the target responds by producing a detectable radio frequency response signal. Such targets have taken the form of tags or labels which are affixed to an object to be identified. As used herein, a "target" is any radio frequency responsive means which may be attached to, printed upon, embedded in, or otherwise associated with an object to be identified. Although the term "radio frequency" is used herein because that is the region of the electromagnetic spectrum which is most frequently used for such automatic identification, it will be understood that any suitable electromagnetic radiation may be used dependent upon the application.

Radio frequency based automatic identification systems are used or contemplated for use in a wide variety of applications for monitoring people, animals, locations, and articles. Such applications include automatic storage and retrieval; baggage sorting and tracking; identification of persons, such as for facility access control or patient tracking; and identification of animals, such as for automatic feeding. One major limitation of presently available RF/ID systems is that target cost is substantial. Another limitation which restricts use of present RF/ID systems is target size. Targets are typically several inches long, which inhibits their use where small items are to be identified or where it is desired that the target be unobtrusive. Under such conditions, target cost and application can only be justified where the target can be removed and reused and where discretion or secrecy is not essential. For example, one particular application where such limited devices may be useful is in the retail garment industry.

Both of these limitations result in large part from the structure typically employed for RF/ID targets and the

frequency at which they operate. Such targets typically contain an antenna for receiving an interrogating RF signal; radio frequency processing means (e.g. integrated circuits) for determining whether an interrogating signal has been 5 received; in some instances a power source such as a battery which increases size and cost of the target; and radio frequency transmitting means responsive to the processing means for transmitting a detectable RF response signal from the target. Additionally, and with regard to ecological 10 considerations, existing targets are not easily disposable, biodegradable or generally environmentally friendly.

One application for which present RF/ID techniques have been used, but are limited due to the cost, size, and limited information processing rate of existing targets, is 15 identification of gaming tokens such as those used in casinos and similar types of gaming establishments. These tokens or chips are kept in a casino vault, are passed between one or more cashier's cages and used as a form of currency within the casino. As such, these chips are a 20 valuable commodity that are subject to theft, counterfeiting and the like. For example, a casino employee may steal chips stored in the vault for personal use or for black market sale to unscrupulous players. Chips may similarly be stolen by employees in a cashier's cage, or at one or more 25 gaming tables. Another common occurrence is a so-called "snatch and run" where chips are stolen from a gaming table or a player, and the thief then escapes by running into a crowd on the casino floor. As a consequence, casinos expend considerable time and effort in manually observing players, 30 game operators, and other casino employees in an effort to make certain that all of the games are fairly played and that chip theft and the use of unauthorized or counterfeit chips is kept to a minimum.

Additional time and effort is also spent monitoring and 35 tracking players' gaming habits such as frequency of visits to a casino, average dollar amount placed per game, total dollar amount played and the like. Such tasks are usually the responsibility of a floor manager or similar casino

employee. A new player must first be acknowledged by the floor manager who then enters the player's identification card into a database and then manually tracks the player's gaming habits. Based on this information, certain players 5 are rewarded by the casino with complimentary services ("comps") such as meal and lodging vouchers to entice the players to continue gaming. This manual tracking is not always an accurate or reliable method of obtaining important information which can directly effect casino revenue.

10 Tracking systems and methods capable of accomplishing these tasks are disclosed in US Patents 5,651,548 issued July 29, 1997 to French et al. and 5,735,742 issued April 7, 1998 to French and are herein incorporated by reference. However, such systems require the use and interaction with chips that 15 are bulky or otherwise undesirable for use in a gaming establishment.

Therefore there is a need in the art for a device and an automatic identification system capable of interacting with each other. The device should not be unduly bulky, 20 expensive to manufacture or operate and should be passive in nature so as to not disturb players from their gaming routines or habits or alert those attempting to thwart or otherwise misuse the device. The system should be able to identify a plurality of the devices individually (by for 25 example serial number), track and record players' gaming routines based on movement of the devices and introductory information provided by the players.

SUMMARY OF THE INVENTION

30

The disadvantages associated with the prior art are overcome by system and method of using said system in a casino-based environment to obtain information and identify player behavior and gaming token movement. The system 35 comprises one or more gaming tables, a plurality of article identification sensors disposed within the gaming tables, a central processor connected to the sensors and a plurality of trackable articles disposed about the gaming tables. The

trackable articles are such that they are capable of being detected by sensors and the central processor generates an historical profile and reward information of a player based upon movement of said trackable articles. In greater detail, the trackable articles further comprise one or more resonators. The resonators are fabricated from electromagnetic energy reflecting particles. The resonators are capable of reflecting energy in the radio frequency range and preferably in the Gigahertz range.

10 Additionally, the gaming tables have means for identifying a player. These means may be a player identification card inserted into a player card reader that is connected to the central processor. The system also has means for determining the status of a game being played at 15 one of said gaming tables. The means may be one or more card sensors disposed within gaming tables.

The system is so configured and a method for using the system is provided that the card sensors are connected to said central processor so that upon start of play of a game, 20 a wagered amount, in the form of one or more trackable articles (i.e., casino chips) is identified and entered into the central processor. Then, cards are dealt to one or more players having entered a wagered amount and the cards activate the card sensors to detect start of play. At the 25 conclusion of play, the cards are collected thus deactivating the card sensors. Instructions are then sent to the central processor to record information regarding the wagered amounts into said historical profile and award points to players meeting specified or prearrange criteria 30 such as total dollars wagered, total time spent gaming and the like.

More specifically, the method for collecting information regarding and granting awards to a casino player via an automatic identification system comprises the steps 35 of:

- a. recognizing said player via an automatic identification means;
- b. identifying a wagered amount by said player;

- c. locking said wagered amount into said system;
- d. allowing for play of said wagered amount;
- e. updating said system with the wagered amount;
- f. optionally awarding said player and
- 5 g. updating said automatic identification means with wagered amount and award.

In greater detail, Step b. emits an RF signal from a sensor and receives a reflected signal at the sensor. The reflected signal emanates from one or more casino chips disposed above said sensor. Additionally, the Step a. can include inserting a player identification card into a player card reader and Step c. can include activating at least two player card sensors or one player card sensor and one dealer card sensor disposed in a gaming table whereby the activated 15 sensors instruct a central processor to lock in wagered amounts. Step d. can include deactivating all sensors activated in Step c. which then instructs the central processor to update information in a player profile regarding wagered amounts. Finally, Step e. can include 20 assessing the player profile and previous wager to determine an award value to be granted to the player.

BRIEF DESCRIPTION OF THE DRAWINGS

25 The teachings of the present invention can be readily understood by considering the following detailed description in conjunction with the accompanying drawings, in which:

FIG. 1A is a perspective view of an article in accordance with the subject invention;

30 FIG. 1B is a second embodiment of the article of the subject invention.

FIG. 2 is a block diagram generally illustrating the elements of a system for interacting with said article;

35 FIG. 3 is a partial plan, partial block diagram of an automated rating system of the subject invention;

FIG. 4 is a detailed view of a first display panel of the automated rating system of the subject invention;

-7-

FIG. 5 is a detailed view of a second display panel of the automated rating system of the subject invention;

FIG. 6 is a detailed view of a player identification means of the automated rating system of the subject

5 invention;

FIG. 7 is a cross-sectional view of a chip identification sensor incorporated into the automated rating system;

FIG. 8 is a flow chart of a method of using the
10 automated rating system; and

FIG. 9 depicts the use of one or more player ID cards for single player, multi-player and single player at multi locations scenarios in the subject invention.

To facilitate understanding, identical reference
15 numerals have been used, where possible, to designate identical elements that are common to the figures.

DETAILED DESCRIPTION

20 The present invention provides automatic item identification of information containing components in a manner which, like existing RF/ID systems, can be free from the constraints of line-of-sight detection imposed by braced symbol systems and short range detection imposed by magnetic
25 encoding systems. Unlike existing RF/ID systems, the present invention comprises inexpensive targets which may be of small size and/or large information density. A system for interacting with the targets associated with the present invention is operable in an unobtrusive manner and is
30 capable of identifying the targets and collecting historical data based on target movement within said system. The information-containing components of the invention may be fashioned into targets which are easily applied to a wide variety of items to be identified. Such items may be
35 reliably serialized and subsequently identified using versatile, low-cost interrogating systems.

FIG. 1. is a perspective view of a particular type of target 100 of the subject invention. Specifically, the

target 100 is a token or gaming chip used as a form of currency in a casino or other similar gaming establishment. The chip 100 has a body 102 that is generally similar in shape and size to those chips currently in existence and 5 used in casinos (i.e., approximately 1.6in. in diameter and approximately 1/8in. thick). It will be understood that although not every casino may have identically sized chips, the target of the present invention will match the dimensions, color scheme and/or the general physical 10 characteristics of the chips currently in use by a particular casino. In this way the superior identification and tracking features of the chips will not be detected by those individuals of an unscrupulous or unlawful nature. The chips can, of course, be of any size, shape and color 15 scheme desired by the gaming establishment so as to suit their needs for conducting business, providing esthetic value, advertising and the like.

Disposed within the body 102 of the chip 100 are one or more resonators 104 (shown in phantom to denote subsurface placement). The resonators 104, also known as Taggents™, 20 are microscopic particles that are capable of reflecting electromagnetic energy. Taggents™ is a trademark of Inkode, Inc. of Vienna, Virginia, USA. The resonators 104 comprise a piece of solid material having dimensions, electromagnetic 25 properties, and/or mechanical properties rendering them resonant at radio frequency. Although depicted as line segments representing thin dipoles, it will be understood that the resonators 104 may have a large variety of shapes having suitable radio frequency response characteristics. 30 The design, fabrication and use of such resonators is discussed in U.S. Patent No. 5,581,257 issued December 3, 1996 to Greene et al. and is herein incorporated by reference.

In one embodiment, the chip 100 depicted in FIG. 1 can 35 be a disk-like object formed by extrusion, die stamping or other suitable methods for forming such objects from a suitable raw material (i.e., ceramic or plastic). Prior to

the formation of the chip 100, one or more resonators 104 are introduced into the raw material so that the resonators are intimately intermingled with the raw material. Upon formation (i.e., intrusion, casting or the like) of the chip 5 100, the resonators 104 will function as thin dipoles embedded in the chip 100. Alternately, and as shown in FIG. 1B, the resonator 104 or Taggents™ are grouped onto a medium 106 (i.e., a piece of 24 lb. grade paper). The medium 106 is then incorporated into the chip 100 during the 10 manufacturing process of said chip 100. Note that although a precise method of manufacturing the chip 100 is not further discussed in this disclosure, one skilled in the art of fabrication and integration of the aforementioned raw material and medium 106 would have the required knowledge to 15 create a chip 100 having the desired resonators 104. The above-discussed resonator technology is low-cost as well as environmentally-friendly. As such, these new chips can be manufactured at little or no additional cost and eventual disposal of these new chips is of no greater concern than 20 existing chips to a gaming establishment.

In either embodiment, the resonators 104 can be arranged to form a specific pattern, graphic or otherwise identifying mark 108 that generates a particular identification signal when subjected to an interrogating 25 signal. For example, the identifying mark can duplicate bar codes, be an alphanumeric representation that can be seen on a display device or any predetermined sequence of symbols that are part of a specific coding system (i.e., a unique code for every chip to allow for serializing or a 30 proprietary identification code of a \$5 chip in a specific casino). Both embodiments reveal an identification symbol, marking or the like that is integrated into the structure of the chip 100. As such, the chip (or similarly enhanced article) and the information contained therein is extremely 35 tamper-resistant and durable. Additionally, the resonators 104 do not require a power source; therefore, they can be effectively incorporated into a chip (or similar enhanced article) without their presence being detected.

The resonators 104 may be resonant at several frequencies and may be arranged so that several such frequencies are used to provide identification information in the target 100. Regardless of the specific arrangement or structure, the resonators are configured so that they resonate at least at one resonant frequency which is an information-carrying frequency identifiable to a system within which the chip 100 is used and interacts.

Specifically, FIG. 2 depicts the chip 100 interacting with system 200 that is capable of identifying and evaluating information provided in the chip 100 by the resonators 104. For a complete description of a radio frequency based automatic identification system capable of interacting with the chip 100 of the present invention, the reader is directed to the teachings disclosed in US Patent No. 5,581,257 issued December 3, 1996 to Greene et al. cited earlier. Generally, a block diagram of the system 200 reveals a transmitter 220 that is capable of generating and broadcasting interrogating signals 210 in the radio frequency or other similar band. The interrogating signals 210 strike the resonators 104 and reflect a specific radiation pattern as an identification signal 240. The identification signal 240 is detected by a receiver 230 which is capable of processing the identification signal 240 and providing it to a computer or other identification processing system (not shown) via output 250. For example, the transmitter 220 generates an interrogating signal in the RF (radio-frequency) range and additionally in the range of approximately 100-500 Gigahertz and preferably 10 GHz (10^9 Hz) and the resonators 104 reflect low level energy (i.e. in the microwatt 10^{-6} W range) that is detected by the receiver 230. These operational frequencies allow for scanning and identifying of targets at close range, but without line-of-sight or physical contact constraints. That is, scanning range can be in the range of approximately 2-3 feet dependent upon exact operating frequency, distances between the target 100 and system 200 and local interference.

The ability to identify, monitor and track individual chips is extremely useful. Since the information contained within the chips is unique and tamper-resistant, identifying each chip as a valid currency in a particular casino reduces the likelihood of counterfeiting. Additionally, in a preferred embodiment of the invention, the unique code or identification information for each chip is a non-repeating symbol such as a serial number. That is, each chip is assigned a specific number as part of a series of numbers that are incorporated into the system 200 to identify the chips as valid for use. As such, it becomes increasingly simple to monitor player gaming habits. For example, a player starts his game by requesting \$100 in \$5 chips. The gaming table operator (i.e., blackjack dealer or the like) exchanges recognized currency (i.e., a US Treasury issued \$100 bill) for twenty (20) \$5 casino chips. The chips are identified by the system 200 by their serial numbers. As the player places bets, the system updates the movement of each serialized chip (into the dealer's tray or "bank" when the player loses or out of the bank when the player wins). The use of the gaming chips in accordance with the present invention in the systems described provide for improved tracking and identification of casino based currency. Such improvements reduce illegal activity associated with such currency and increase the ability of the casino to reward frequent and/or large quantity players properly.

Figure 3 broadly depicts an improved system 300 for use in a gaming establishment. The system 300 is an automated rating system that is used in conjunction with the resonator-enhanced chips 100 to enable casino management to more accurately track player habits and chip movement. More specifically, the rating system 300 comprises one or more gaming tables 302 configured with a plurality of player locations 306. Each player location 306 is outfitted with means for identifying a player (e.g., a card reader 308), means for determining the status of a particular game (e.g., a card sensor or photocell 310) and means for recording a player's bet (e.g., a chip identification sensor 312). The

system 300 further comprises additional means for determining the status of a particular game (e.g. a dealer card sensor or photocell 326) and means for identifying a dealer (e.g., a dealer card reader 328) additionally, the 5 system is provided with one or more display panels (a dealer display panel 400, and a floor person display panel 500). The use and a further description of such display panels is described in greater detail below. Each of said gaming tables 302 is tied into a main casino computer 304 for the 10 purposes of among other things, tracking chip movement, updating player histories, rating players for "comps" and identifying chips. The main casino computer 304 includes a processor unit 314, a memory 316, a mass storage device 318, an input control unit 320, and a display unit 322 which are 15 all coupled to a control unit bus 324.

The gaming table 302 further comprises the necessary components to play the desired game. For example, in the system 300 depicted in Figure 3, a Blackjack table is shown. As such, said Blackjack table contains the necessary 20 components to play such game which includes a shoe 330 for dispensing cards to one or more player locations 306, a discard rack 332 for collecting used cards during a play of a hand of Blackjack, a drop paddle 334 for conveying U.S. treasury issue currency (i.e. a \$50 bill) into a drop box 25 (not shown) below the table 302. Of course, each of said gaming tables further comprises a bankroll chip rack 336 which contains casino currency (i.e., chips 100) which are conveyed to players or collected from players based on the outcome of a particular hand. Although the system 300 is 30 depicted and described in specific terms of a Blackjack gaming table and for use of in the game of Blackjack, this does not preclude the use of such system 300 in other types of casino games other than Blackjack which include but are not limited to Roulette, Pai-Gow, Let It Ride, Baccarat, the 35 Big Wheel and the like. It is suggested that one skilled in the art of development and construction of gaming tables would have the necessary skill to incorporate card readers 308 and sensors 310 for players and sensors 326 and readers

328 for dealers to be able to connect the main casino computer 304 into any type of game.

FIGS. 4 and 5 depict additional features of the system for displaying various types of information during gaming. Specifically, the dealer display panel 400 displays information regarding the number of players and their last bets wagered for a particular round of play of a particular game. The display panel 400 is comprised of a player location column 402 and a wagering information column 404. The player location column 402 contains a plurality of rows which correspond to a plurality of player locations 306 on the gaming table 302. In this way, each player is separately identified by their location number. Likewise, the wager information column 404 contains a plurality of rows corresponding to the rows displayed in the player location column 402, wherein each wager information column contains the wagered amount for each player. For example, and as shown in FIG. 4 a particular round of play consists of players at locations 1, 2, and 4. The player at location #1 has bet \$5.00, the player at location #2 has also bet \$5.00, the player at location #4 has bet \$10.00. As such, each of the aforesaid amounts appear next to the player location in the wagering information column 404. Those player locations that are unoccupied during a particular round of play display no wager information on the display panel 400. The wagering information is displayed during the entire round of play during a particular game. Such information is cleared from display upon the dealer taking the necessary steps to complete the particular round and prepare for a new round of play.

FIG. 5 depicts in greater detail the floor person display panel 500. Specifically, floor person display 500 displays more detailed information regarding specific players while they are engaged in rounds of play at a particular gaming table(i.e., gaming table 302). The display panel 500 further comprises a player location column 502, a player identification column 504, a player account number column 506, a start time column 508, an accumulated

points total column 510 and a comment column 512. These columns are exemplary in nature and the display 500 (or display 400) can be configured in any desirable manner to convey requested information. The floor person display 5 panel 500 further comprises a player information button 514 and a plurality of player print buttons 516. In a preferred embodiment of the invention, there is one player information button 514 and the plurality of player print buttons 516 that correspond to the plurality of player locations 10 displayed on the floor person display panel 500 (i.e., seven).

The floor person display panel 500 becomes active when a player activates a player location card reader 308 with his/her player ID card (shown in greater detail in FIG. 6). 15 Information encoded on the player ID card includes a players name which is displayed in column 504 and players account number which appears in column 506. The time at which the players inserts his/her ID card into the card reader 308 is displayed in the time start column 508 and the number of 20 credits or points available to the players (i.e. points attained during players previous games or otherwise earned as part of a reward or "comp" scale) is displayed in column 510. Column 512 is available for displaying information from the main casino computer 304 back to the floor person. 25 Information such as a tampered player ID card or the like can be displayed in said comment column 512. During normal play and operation of the floor person display panel 500, the panel will remain dark and no information is displayed. Upon request of the floor person, information can be 30 displayed by activating the player information button 514 which temporarily displays player name and other related information for quick viewing by the floor person. The panel may then remain lit for a predetermined amount of time or can be turned off manually by activating the player 35 information button 514 a second time. Properly tracking the players and their win or loss amounts and generating rating cards for specific players is conducted via activation of one or more of the player print buttons 516. For example, a

particular player (i.e., player #2 depicted in FIG. 5) may be of interest to the floor person after having played either for a substantial amount of time or having spent a substantial amount of money during play. Upon a players 5 reaching of certain criteria, the floor person may choose to generate a rating card for this particular player in order to record such information for historical and statistical purposes. By activating a particular player print button 516 next to the desired player's name on display panel 500, 10 a signal is passed to the main casino computer 304 which in turn generates and prints a report to a printer in proximity to the gaming table 302 where such player is playing.

FIG. 6 depicts card reader 308 in greater detail. Specifically card reader 308 is disposed within a playing 15 surface of the gaming table 302 and is further provided with a card slot 604. A player ID card 602 containing biographical, historical and statistical gaming information of a player is encoded on the player ID card. When a player prepares to enter a round of gaming, he/she inserts his ID 20 card 602 into the card reader slot 604. The encoded information is then read by the card reader supporting circuitry (not shown) and is transmitted to the main casino computer 304 for acknowledgment of the player and the beginning of additional recording of historical and 25 statistical information. Dealer card reader 328 is not shown in detail, but is understood to be of similar design and construction to player card readers 308. That is, dealer card readers 328 are also disposed within a playing surface of the gaming table 302 (usually one reader per 30 table) and provided with a slot. The dealer will insert or remove his/her dealer ID card upon opening a table for a new gaming shift or when moving from one table to another. The inserted dealer ID card inserted into a particular gaming table indicates to the main casino computer 304 that a new 35 gaming session is about to start under the direction of that particular dealer. Removal of the dealer ID card indicates to the main casino computer 304 that a particular gaming session has ended.

FIG. 9 depicts the use of one or more player ID cards for single player, multi-player and single player at multi locations scenarios. For example, when a single player prepares for gaming (a player approaching gaming location 5 #5) he/she inserts a player ID card 602 into the slot 604 of the card reader of player location #5. This encoded information on the player ID card is relayed to the main casino computer 304 and player location #5 is prepared to continue to receive historical gaming information about such 10 player. In another scenario, if a single player were to play at a single location he/she would insert his ID card at location #1 and begin normal play. Should said player want to play at one or more additional locations (i.e. locations 15 #2 and/or #3) one or more generic player cards 902 would be available from the dealer. Said generic player cards do not contain specific biographical or statistical information about the player at location #1. However, it indicates to the main casino computer 304 that the location containing the generic player card should be acknowledged as part of a 20 specific player profile for example, the profile of the player at location #1. This affords the player at location #1 the benefit of playing three hands simultaneously and accumulating historical data of such three locations so that all money that has been wagered by the player is included in 25 an analysis of complementary rewards or the like. The information accumulated at player locations #2 and #3 indicated by arrows 904 are incorporated into the information of player location #1 with all such information being relayed to the main casino computer 304. Unoccupied 30 player locations (i.e., 4, 6 and 7) remain inert during a round of play and do not effect historical data or information collection to the main casino computer 304.

It is within the scope and spirit of the subject application to include other types of player and dealer 35 identification means. One skilled in the art can readily substitute the slotted card reader (308/604) or dealer card reader (328/604) with for example an RF/ID reader (not shown). The RF/ID card reader would have technology similar

to that of the means for recording a player's bet (i.e., the chip identification sensor 312). A detailed description of a chip identification sensor 312 follows and it is suggested that one skilled in the art can readily incorporate similar 5 sensors into the gaming table 302 to act as player or dealer ID card readers thereby eliminating the need for card slots. Information provided by the player or dealer ID cards are encoded with the resonators 104 in a predetermined manner. As such, a player or dealer card placed within the sensing 10 range of an appropriate player or dealer card sensor (308 or 328), activates that location and sends an appropriate signal to the main casino computer to either activate a specific player location (for an accepted player ID card) or the gaming table for a new gaming session (for an accepted 15 dealer ID card).

Fig. 7 depicts a cross-sectional view of a typical player location 306 at the gaming table 302. The gaming table is comprised of a base layer 702 (preferably solid wood). Disposed on top of the base layer 702 is an 20 intermediate layer 704 (preferably plywood). Disposed above the intermediate layer is a finishing layer 706 (preferably a resilient material such as a foam padding). A decorative layer 708 is disposed on top of the finishing layer 706. The decorative layer 708 is preferably a gaming table cloth, 25 i.e., for a Blackjack) that indicates specifics of the particular game being played at table 302 such as rules of the game, betting odds and the like, identification of player locations and the like.

The above mentioned means for detecting a players bet 30 (i.e. chip identification sensor 312 is disposed within the base layer 302. Said means can be affixed by a variety of methods known to those skilled in the art such as threading, pressure fitting, adhesive means or the like. An opening 710 is formed within a portion of the base member and most 35 of the intermediate layer 704 so as to increase transmission efficiency of emissions provided by the chip identification sensor 312. The chip identification sensor 312 is electrically connected to the main casino computer 304 (not

shown in Fig. 7) via a transmission cable 712. The decorative layer 708 contains a plurality of markings that identify player locations such as the one shown 306 upon which one or more gaming tokens or chips 100 can be disposed 5 to indicate a wager. At the beginning of a new game, the chip identification sensor 312 emits radiation towards the marked player location 306. Such radiation is absorbed and reflected in a particular pattern by virtue of the resonators disposed within each of the chips 100 so as to 10 identify the number and value of the chips 100 which constitute the particular wager of the player. The chip identification information is passed back through the chip identification sensor 312 to the main computer 304. This information is also viewed at dealer display panel 400 15 during the play of the hand of blackjack. The chip identification sensor 312 is strategically located within the gaming table 302 so as to define a conical sensor field 714 emanating from the sensor 312 through the gaming table 302 and into a region of space directly above the marked 20 player location 306. Such sensor field 714 however does not intrude upon other player locations in close proximity thereto.

Resonator 104 enhanced devices have been shown and described in use in a gaming establishment to identify 25 players, dealers, token authenticity and token value. However, this technology can be further extended into the gaming industry to increase the accuracy of a round of play. Specifically, resonators can be incorporated into playing cards to identify their authenticity and value as well. For 30 example, card shoe 330 can optionally be provided with a playing card sensor 338 that is similar in design and construction to chip identification sensor 312. The playing card sensor is also electrically connected to the main computer 304 via a flexible transmission cable (not 35 shown). Each of a plurality of playing cards 340 in the shoe is provided with a specific resonator pattern that identifies that particular card (i.e., three 45° slanted resonators identifies the "three of hearts" playing card and

the like). The specified identification pattern is for exemplary purposes only. It is submitted that any type of pattern can be used to identify the playing cards including randomly assigned patterns, serialization and the like. The 5 playing card sensor 338 emits radiation that is absorbed and then reflected in the predetermined pattern by the resonators 104. The reflected signal is passed to the main casino computer 304 which identifies the playing card and the "three of hearts." The identified cards can then be 10 optionally displayed in a playing card display panel 342. In this manner, playing card values are confirmed by the main casino computer 304 and honest, error-free play is maintained.

The system 300 operates in accordance with an automated 15 rating system program that is part of the subject invention. That is, the processor unit 314 forms a general purpose computer that becomes a specific purpose computer when executing programs such as a program for identifying chips, rating players and other gaming activities as previously 20 described. The requirements of the subject program are outlined in greater detail below. Although the invention is described herein as being implemented in software and executed upon a general purpose computer, those skilled in the art will realize that a method of the present invention 25 could be operated using hardware such as an application specific integrated circuit (ASIC) or other hardware circuitry. As such, the invention should be understood as being able to be implemented, in whole or in part, in software, hardware or both.

30 The processor unit 314 is either a microprocessor or other engine that is capable of executing instructions stored in a memory. The memory 316 can be comprised of a hard disk drive, random access memory ("RAM"), read only memory ("ROM"), a combination of RAM and ROM, or another 35 processor readable storage medium. The memory 316 contains instructions that the processor unit 314 executes to facilitate chip identification, player rating and other gaming related activities as described in greater detail

below. The instructions in the memory 316 are in the form of program code. The program code may conform to any one of a number of different programming languages. For example, the program code can be written in C+, C++, BASIC, Pascal, 5 or a number of other languages.

The display unit 322 provides information to a casino manager in the form of graphical displays and alphanumeric characters under control of the processor unit 314. The input control unit 320 couples a data input device, such as 10 a keyboard, mouse, or light pen, to the other computer components to provide for the receipt of input from an operator or from the gaming table 302.

The control unit bus 324 provides for the transfer of data and control signals between all of the devices that are 15 coupled thereto. Although the control unit bus 324 is displayed as a single bus that directly connects the devices in the main casino computer 304, the control unit bus 324 can also be a collection of busses. For example, the display unit 322, input control unit 320 and mass storage 20 device 318 can be coupled to an input-output peripheral bus, while the processor unit 314 and memory 316 are coupled to a local processor bus. The local processor bus and input-output peripheral bus are coupled together to form the control unit bus 324.

25 Fig. 8 depicts a method 800 of operating an automated rating system, particularly an automated rating system in a gaming establishment for tracking and identifying gaming tokens and thereby obtaining player information and granting awards. The method begins at step 802 and proceeds to step 30 804 where a player recognition step is executed. Such player recognition step is, for example, executed upon a new player entering their player card 602 into a player card reader 308 of one of a plurality of a player betting locations 306. A generic card recognition step 806 is 35 optionally executed after player recognition step 804. Such generic card recognition step 806 requires that a generic player card such as card 902 of Figure 9 be inserted into a unoccupied player card reader 308 of an additional player

location 306. Player recognition step 804 concludes with the display of various information contained on the player ID card and/or accessed by the main casino computer 304. Such information is displayed on the floor persons display 5 panel 500 of gaming table 302.

Step 808 is an optional printing of a player rating card. Such player rating card, if needed, can be generated by the floor person by pushing a print button 516 on the floor persons display panel 500 that corresponds to the 10 desired player of which information is requested. The player rating card contains information about the player including but not limited to name, document number, account number (or patron number), available points, number of days played, average bet history, hit number, game type, table 15 number, seat number, date, start time, and miscellaneous comments. It is noted that step 808 may be executed at any time during the method 800 and not necessarily prior to play of a hand.

At step 810 a round of gaming is initiated by one or 20 more players placing a bet on one of the player bet sensors 312 (indicated by a circle on decorative layer 708). A dealer then begins to deal cards to players and places the cards so that they cover the card sensor or photo cell 310 (hence "activating" the sensor) at the player locations 306. 25 The system 300 locks in the bets of all players upon the first two player photocells being covered or upon one player photocell and a dealer photocell 326 being covered. The wagers of all players are displayed on the dealer display panel 400 of the gaming table 302. Such wagers are also 30 logged in by the main casino computer 304. These wagers remain illuminated at the dealer display panel 400 during the entire round of play. When the round of play is complete and all cards, including the dealers cards, are 35 picked up by the dealer all photocells (310 and 326) are exposed to light. Exposing the photocells to light, "deactivates" the sensors thereby signaling the system to reset the dealer display panel 400 and to prepare for another round of play. In a preferred embodiment of the

-22-

invention, all photocells of the gaming table are linked in series so that the method 800, or gaming program of system 300, do not reset until all photocells have been uncovered or deactivated. At step 814 comp points are awarded to 5 players who participated in the just concluded round of play. Specifically, the information regarding the wager amounts locked in and passed on the main casino computer 304 are accessed point values. These point values are then added to the individual player accounts at the conclusion of 10 a round of play. Specifically, comp points are not awarded until at least one player photocell and the dealer photocell have been covered and then subsequently uncovered as part of the resetting process for the next hand. A multi-tiered system can be used in the method 800 to award points for 15 different ranges of wagered amounts. An exemplary three-tiered system would be as follows:

	<u>Wagered Amount</u>	<u>Earned Points (per \$1 wagered)</u>
20	\$1 - \$24	0.00166
	\$25 - \$100	0.00333
	\$101 and above	0.00333

Of course it is to be understood that any type of tiered 25 system or flat rate point assessment can be incorporated into the method 800 for awarding points to players. Such point values are modified and adjusted by casino management. Additionally, the method 800 will award the points to individuals playing at one more locations in proportion to 30 the amounts wagered at each of those locations. The awarded points amount will be displayed in the floor persons display panel 500. Additionally, the total point value for the player will be accumulated and constantly updated by the main casino computer 304 and this information encoded onto 35 the player identification card 602 so that all information regarding a particular players gaming occurrences is accurately recorded. All updated information is incorporated into the player ID card at step 816. At this

-23-

point the method 800 then prepares to begins another round of play by looping up to step 802.

The present system and method for tracking chip and player habits facilitates obtaining information on individual players so as to properly award them based on the amount of money they have wagered over a course of time, the amount of time they have played, the number of times they have visited a particular gaming establishment, and the like. Such information was previously collected by hand and as such was potentially unreliable and did not accurately account for all activities of a particular player. The system and method also accurately track the movement of gaming tokens, i.e. chips within the gaming establishment so as to reduce the likelihood of fraud and to passively enter wager information of a particular player. These two aspects of the system can be practiced independently of each other or in unison dependant upon gaming establishment requirements.

Although various embodiments which incorporate the teachings of the present invention have been shown and described in detail herein, those skilled in the art can readily devise many other varied embodiments that still incorporate these teachings.

What is claimed is:

1. A casino-based automated rating system comprising:
 - one or more gaming tables;
 - 5 a plurality of article identification sensors disposed within said one or more gaming tables;
 - a central processor connected to said plurality of sensors;
 - a plurality of trackable articles disposed about the 10 one or more gaming tables whereby, the trackable articles are detected by said plurality of sensors and said central processor generates historical profile and reward information of a player based upon movement of said trackable articles.
- 15 2. The system of Claim 1 wherein said trackable articles further comprise one or more resonators disposed therewithin.
- 20 3. The system of Claim 2 wherein said resonators are fabricated from electromagnetic energy reflecting particles.
4. The system of Claim 3 wherein said resonators are capable of reflecting energy in the radio frequency range.
- 25 5. The system of Claim 3 wherein said resonators are capable of reflecting energy having a frequency in the range of approximately 100-500 Gigahertz.
- 30 6. The system of Claim 1 wherein the one or more gaming tables further comprise means for identifying a player.
7. The system of Claim 6 wherein said means comprises a player identification card inserted into a player card reader.

-25-

8. The system of Claim 6 wherein said means comprises a resonator-based player identification card disposed proximate a sensor.

5 9. The system of Claim 6 wherein said player identification means is connected to the central processor.

10. The system of Claim 1 further comprising means for determining the status of a gaming being played at one of 10 said gaming tables.

11. The system of Claim 10 wherein said determining means comprises one or more card sensors disposed within said one or more gaming tables.

15 12. The system of Claim 11 whereby said one or more card sensors are connected to said central processor so that upon start of play of a game at said one or more gaming tables, one or more wagered amounts in the form of one or more trackable articles is identified and entered into the central processor, cards are dealt to one or more players having entered said one or more wagered amounts, said cards activating said one or more card sensors to detect start of play, said cards are collected at the conclusion of play, thus deactivating said one or more card sensors thereby instructing said central processor to record information regarding wagered amounts into said historical profile and award points to said one or more players.

30 13. A method for collecting information regarding and granting awards to a casino player via an automatic identification system, said method comprising the steps of:

- a. recognizing said player via an automatic identification means;
- b. identifying a wagered amount by said player;
- c. locking said wagered amount into said system;
- d. allowing for play of said wagered amount;
- e. updating said system with the wagered amount;

- f. optionally awarding said player and
- g. updating said automatic identification means with wagered amount and award.

5 14. The method of Claim 13 wherein step b. further comprises emitting an RF signal from a sensor and receiving a reflected signal to said sensor.

10 15. The method of Claim 14 wherein said reflected signal emanated from one or more casino chips disposed above said sensor.

15 16. The method of Claim 13 wherein step a. further comprises inserting a player identification card into a player card reader.

17. The method of claim 13 where said step a. further comprises disposing a resonator-based player identification card proximate a sensor.

20 18. The method of Claim 13 wherein step c. further comprises activating at least two player card sensors disposed in a gaming table, said activated sensors instructing a central processor to lock in said wagered amounts.

25 19. The method of Claim 13 wherein step c. further comprises activating at least one player card sensor and one dealer card sensor disposed in a gaming table, said activated sensors instructing a central processor to lock in said wagered amounts.

20. The method of Claim 13 wherein step d. further comprises deactivating all sensors activated in step c, said deactivated sensors instructing a central processor to update information in a player profile regarding wagered amounts.

-27-

21. The method of Claim 20 wherein step e. further comprises assessing the player profile and previous wager to determine an award value.

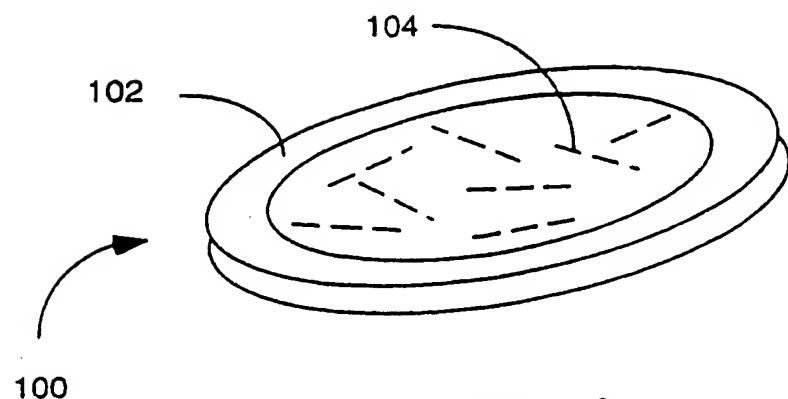


FIG. 1A

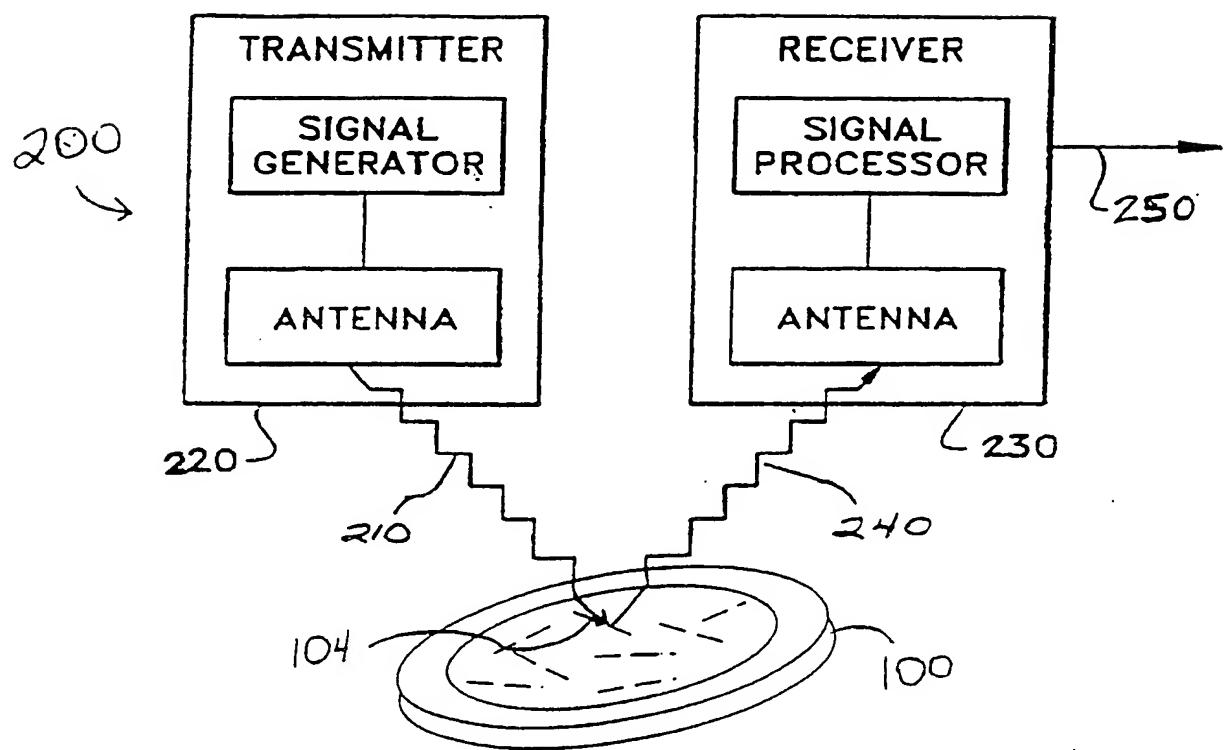


FIG. 2

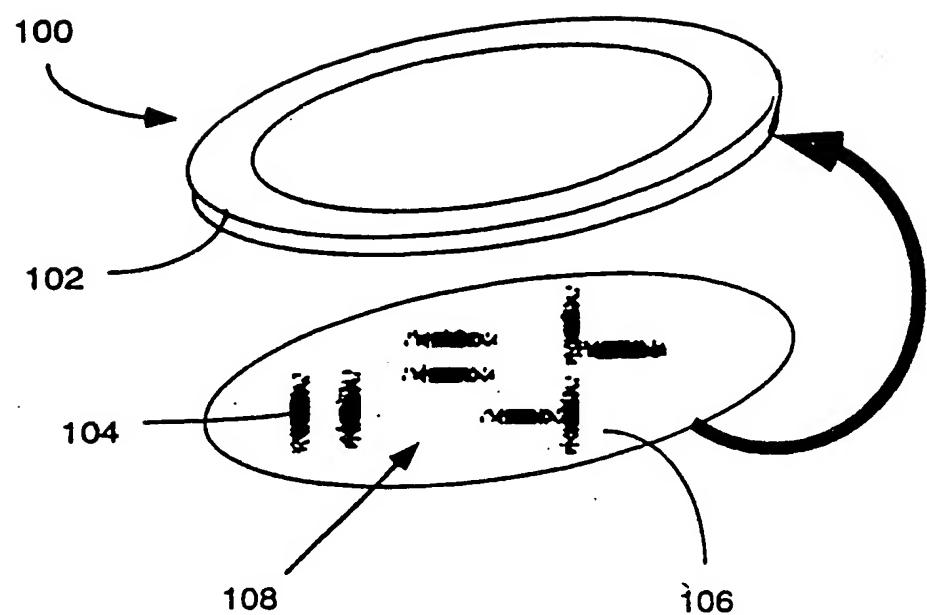


FIG. 1B

300

FIG. 3

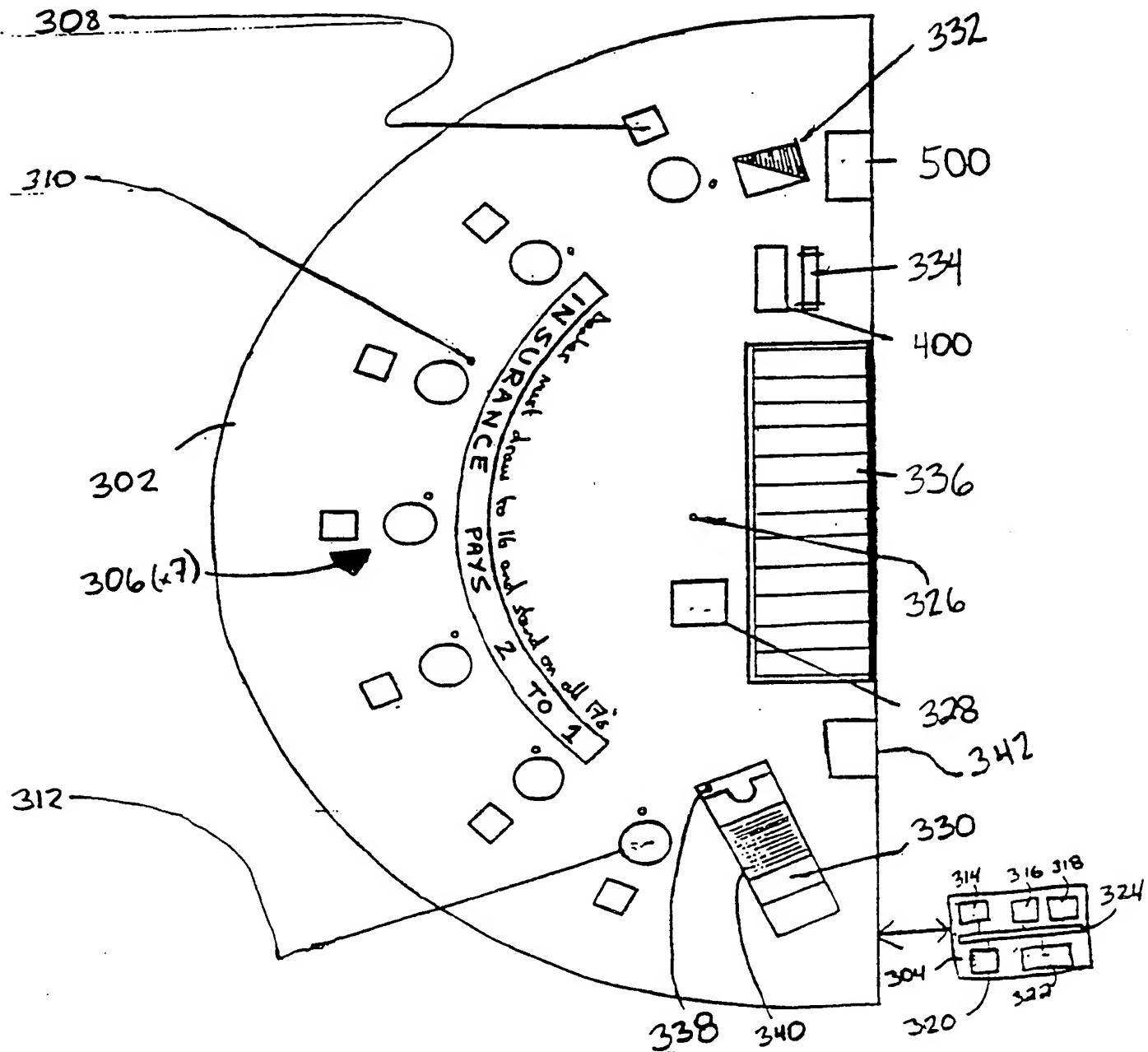


FIG. 4 4/8

PLAYER LOCATION	LAST BET WAGERED.
1	\$5
2	\$5
3	
4	\$10
5	
6	
7	

FIG. 5

The diagram shows a handheld device with a screen displaying a table. The table has columns for Player's Name, Acc. #, Time Start, Available Points, and Comments/Alert. There are 7 rows, numbered 1 to 7. Row 1 contains data for John Smith and row 2 for Lee Jones. The device has a numeric keypad on the right with labels 502, 500, 504, 506, 508, 510, 512, and 514 above the keys. A brace on the right side of the keypad is labeled '5.'

	PLAYER'S NAME	Acc. #	TIME START	AVAILABLE POINTS	COMMENTS/ ALERT
1	John Smith	123456	12:01am	100	Accounts Closed
2	Lee Jones	789012	11:45pm	35	Bonus Points
3					
4					
5					
6					
7					

FIG. 6

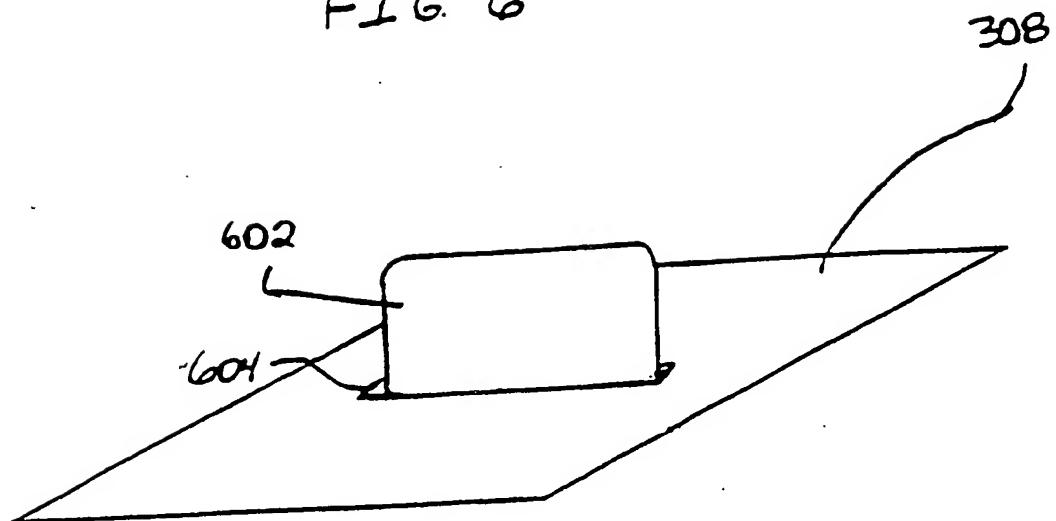


FIG. 9

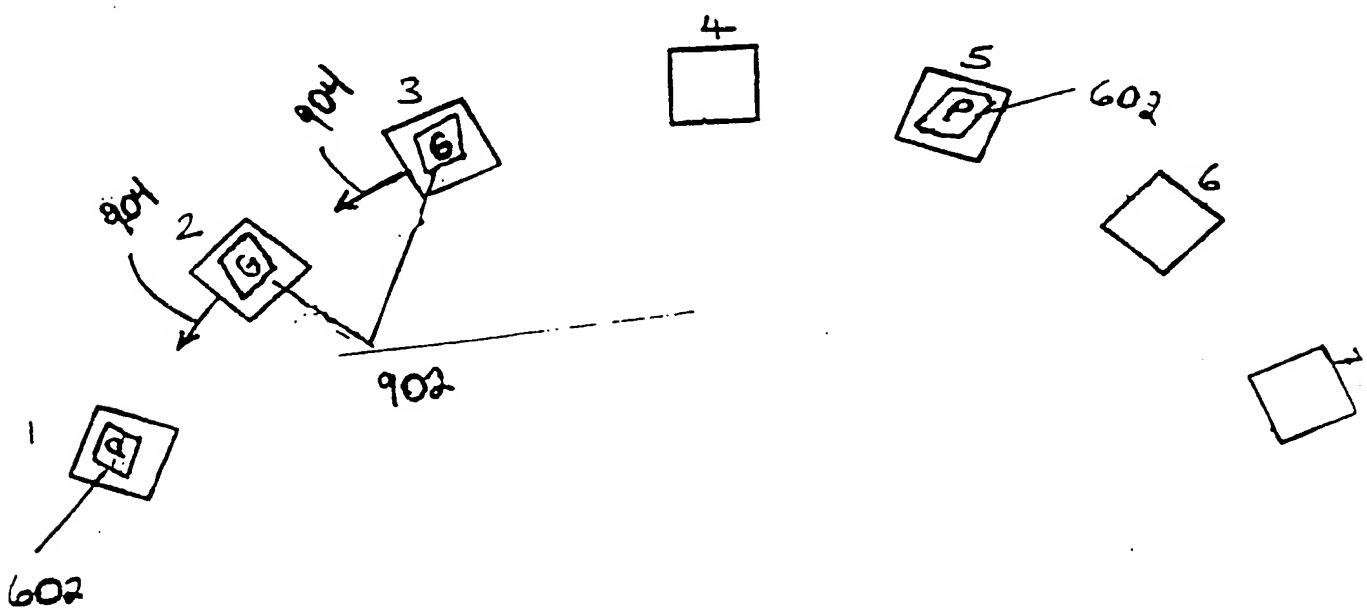


FIG. 7

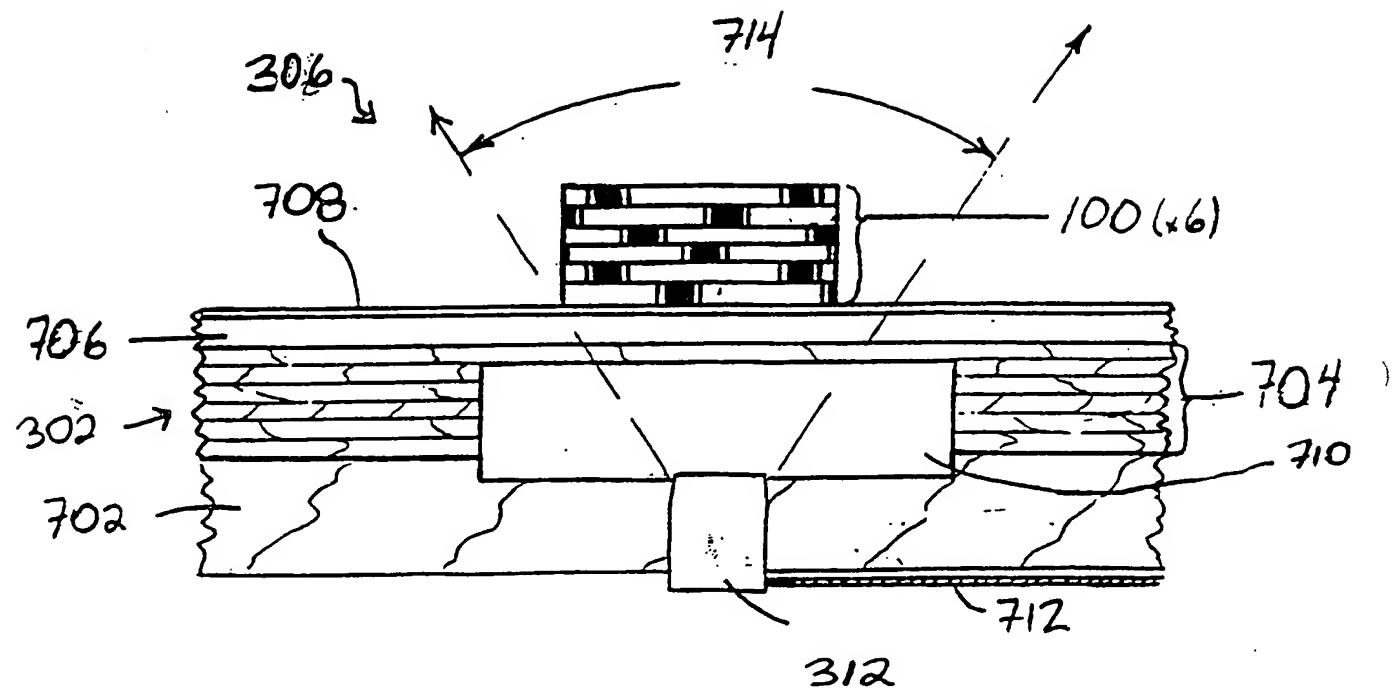
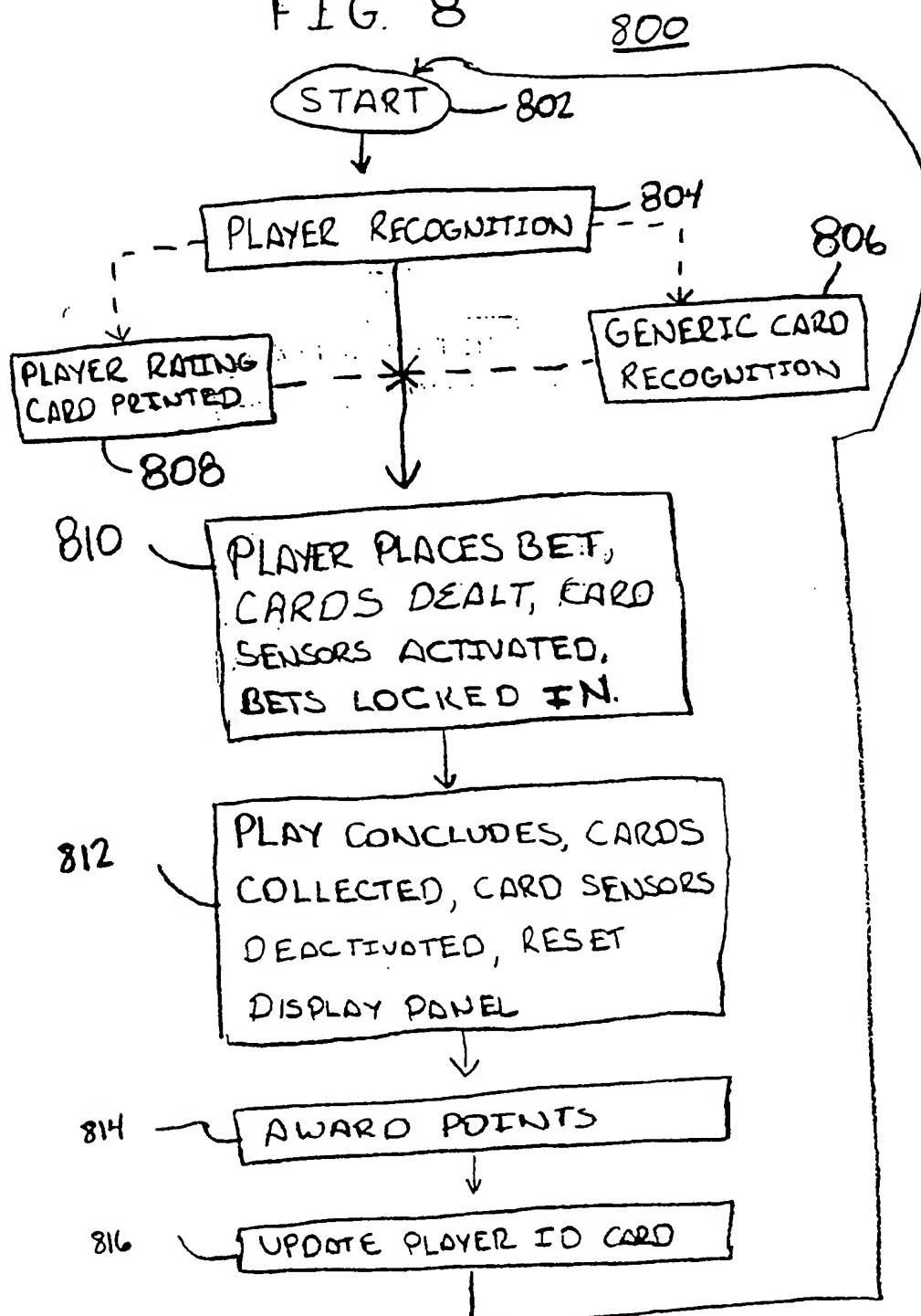


FIG. 8





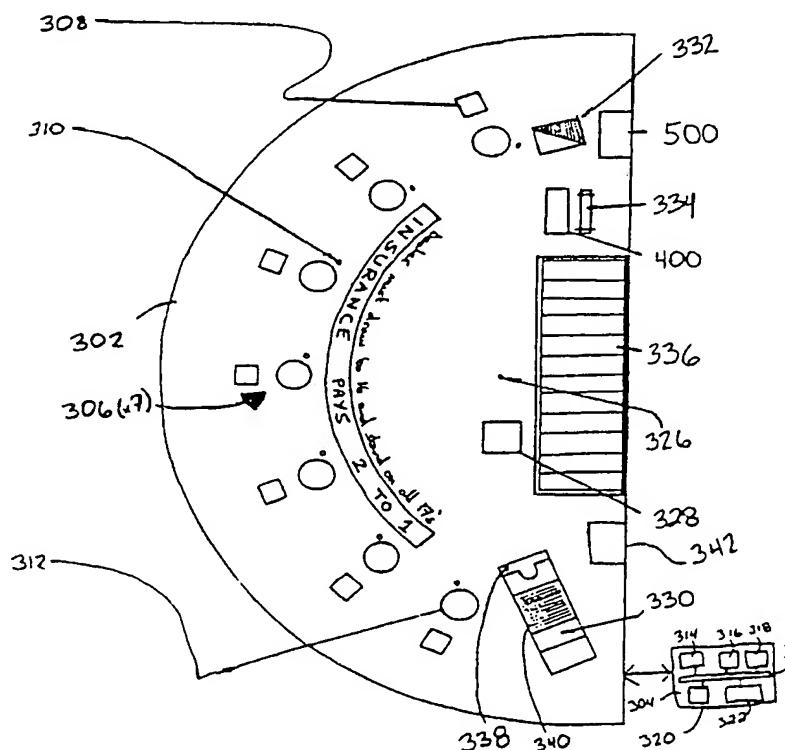
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 7 : A63F 9/24		A3	(11) International Publication Number: WO 00/22585
			(43) International Publication Date: 20 April 2000 (20.04.00)
(21) International Application Number: PCT/US99/23778		(81) Designated States: AE, AL, AU, BA, BB, BG, BR, CA, CN, CU, CZ, EE, GE, HR, HU, ID, IL, IN, IS, JP, KP, KR, LC, LK, LR, LS, LT, LV, MG, MK, MN, MX, NO, NZ, PL, RO, SG, SI, SK, SL, TR, TT, UA, UG, UZ, VN, YU, ZA, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).	
(22) International Filing Date: 13 October 1999 (13.10.99)			
(30) Priority Data: 60/104,041 13 October 1998 (13.10.98) US Not furnished 12 October 1999 (12.10.99) US			
(71)(72) Applicants and Inventors: GANZ, Jake [US/US]; 45 Gifford Street, Norwich, CT 06360 (US). BRADSHAW, William, R. [US/US]; 414 West Corner Road, North Stonington, CT 06359 (US). SMITH, Kingsley, L. [US/US]; 125 Frigate Drive, Madison, WI 53705 (US). SCHUTZBANK, Howard [US/US]; 6296 Onwentsia Trail, Oregon, WI 53575 (US). MANN, John [US/US]; 60 Richard Brown Drive, Uncasville, CT 06382 (US).			
(74) Agents: MOSER, Raymond, R., Jr. et al.; Thomason, Moser & Patterson, 2 Bridge Avenue, P.O. Box 8160, Red Bank, NJ 07701 (US).			

(54) Title: AUTOMATICALLY IDENTIFIABLE AND TRACKABLE ARTICLE AND SYSTEM INTERACTING WITH SAME

(57) Abstract

System and method of using the system (200, 300, 800) in a casino-based environment to obtain information and identify player behavior and gaming token (100) movement. The system (300) includes one or more gaming tables (302), a plurality of article identification sensors (312) disposed within the gaming tables (302), a central processor (304) connected to the sensors (312) and a plurality of trackable articles (100) disposed about the gaming tables. The trackable articles (100) are capable of being detected by sensors (312) and the central processor (304) generates an historical profile and reward information of the player based upon movement of the trackable articles (100). The method (800) for collecting information regarding and granting awards to a casino player via an automatic identification system includes recognizing the player via an automatic identification means (308), identifying a wagered amount by the player (312), locking the wagered amount into the system (300), allowing for play of the wagered amount, updating the system with the wagered amount, optionally awarding the player and updating the automatic identification means (308) with the wagered amount and award.



FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakhstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US99/23778

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) :A63F 9/24
 US CL :463/25, 29; 705/16-18; 235/375, 380; 340/825.31, 825.34, 323R
 According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : Please See Extra Sheet.

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
 NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

NONE

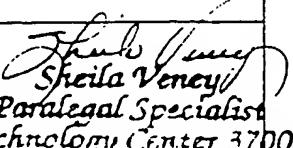
C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4,531,187 A (UHLAND) 23 JULY 1985, See entire document.	1-21
A	US 4,814,589 A (STORCH et al.) 21 March 1989. See entire document.	1-21
A	US 5,429,361 A (RAVEN et al.) 04 JULY 1995. See entire document.	1-21

<input type="checkbox"/>	Further documents are listed in the continuation of Box C.	<input type="checkbox"/>	See patent family annex.
	Special categories of cited documents:		
A*	Document defining the general state of the art which is not considered to be of particular relevance	"P"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
E*	earlier document published on or after the international filing date	"N"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
L*	document which may throw doubt on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
O*	document referring to an oral disclosure, use, exhibition or other means	"S"	document member of the same patent family
P*	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search	Date of mailing of the international search report
09 MARCH 2000	06 APR 2000

Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer M. SAGER Telephone No. (703) 308-1148
---	--


 Sheila Veney
 Paralegal Specialist
 Technetology Center 3700

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US99/23778

B. FIELDS SEARCHED

Minimum documentation searched

Classification System: U.S.

463/12-13, 16, 25-29, 36, 39-42; 705/16-18; 235/375, 380; 340/825.31, 825.34, 323R; 700/91-93; 273/138.1, 138.2, 139, 143R, 148B, 292, 293, 309.